

CLAIMS

1. Apparatus for predistorting an input signal applied to a radio frequency (RF) power amplifier, the apparatus comprising:
- an RF phase discriminator, for generating output signals indicative of phase and amplitude differences between two input signals;
- means for coupling a portion of an RF amplifier input as a first input signal to the RF phase discriminator;
- means for coupling a portion of an RF amplifier output as a second input signal to the RF phase discriminator, wherein the coupled portion of the RF amplifier output is scaled to be comparable with the RF amplifier input;
- an analog-to-digital converter for converting difference signals generated by the RF ~~comparator~~ ^{phase discriminator} to digital form;
- a computation module for deriving from the difference signals corresponding values of gain compression and RF amplifier output phase;
- means for coupling a portion of the RF amplifier input to the analog-to-digital converter, to derive RF amplifier input values in digital form;
- a digital memory, for storing in association with each other, values of RF amplifier input, gain compression and RF amplifier output phase; and
- an amplifier predistorter, for adjusting the amplitude and phase of the RF amplifier input based on the stored values of gain compression and RF amplifier output phase, to compensate for distortion in the RF amplifier.

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converting, in an analog-to-digital converter, the RF ^{comparator} output

difference signals from analog to digital form;

computing from the digital difference signals corresponding values of RF amplifier gain compression and RF amplifier output phase;

storing, in association with each other in a lookup table, values of RF amplifier input, amplifier gain compression and amplifier output phase; and

predistorting the RF amplifier input in amplitude and phase, based on stored values of gain compression and amplifier output phase associated with a desired value of RF amplifier input.

9. A method as defined in claim 8, wherein the step of converting the difference signals to digital form comprises receiving as parallel inputs to the analog-to-digital converter in-phase (I) and quadrature (Q) difference signals from the RF phase discriminator and generating the digital equivalents of these difference signals.

10. A method as defined in claim 9, and further comprising:
coupling a portion of the RF amplifier input to a third parallel input of the analog-to-digital converter; and
generating the digital equivalent of the RF amplifier input.

11. A method as defined in claim 10, wherein:

the storing step comprises storing in the lookup table data values for the RF amplifier inputs and corresponding values of amplifier gain compression and amplifier output phase; and

the predistorting step includes accessing the lookup table based on a current value of RF amplifier input, and retrieving the corresponding values of amplifier gain compression and amplifier output phase.

12. A method as defined in claim 11, wherein the storing step stores running averages of the amplifier gain compression and amplifier output phase.

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13. A method as defined in claim 11, wherein the ~~digital memory~~ ^{storing step} comprises additional lookup tables, each corresponding to a different RF amplifier operating frequency, and wherein the storing step includes selecting a lookup table based on RF amplifier frequency, and storing in the selected lookup table values for RF amplifier input, amplifier gain compression and amplifier output phase.

14. A method as defined in claim 8, wherein the step of predistorting comprises automatically compensating for changes in amplifier characteristics that cause corresponding changes in amplifier distortion.